

APPENDIX N: Aldicarb Degradation and Persistence

Summary of available persistence data for aldicarb and its sulfoxide and sulfone degradates

Fate Endpoint *	Aldicarb	Aldicarb sulfoxide	Aldicarb sulfone
Hydrolysis – pH 5	stable (MRID 00102065)		495 da (MRID 45592104*)
Hydrolysis – pH 7	stable (MRID 00102065)	6% loss at 30 da (MRID 00102066)	63 da (MRID 45592104*)
Hydrolysis – pH 9	<10% loss at 30 da (MRID 00102065)	2.3 da (MRID 00102066)	1 da @ 25°C; 32 da @ 5°C (MRID 45592104*)
Hydrolysis in published literature: Lemley & Zhong, 1983 (45602901**); Hansen & Spiegel, 1983 (45602902**); Lemley & Zhong, 1984 (45602903**)	<p>Hydrolysis is sensitive to hydroxide concentration (base-catalyzed), with sulfone most sensitive and aldicarb least (Lemley & Zhong, 1983).</p> <p>Aldicarb hydrolysis rates increase at pH levels >7.5; sulfoxide and sulfone hydrolyze more readily and are affected by pH and temperature (results for 5, 15 °C) (Hansen & Spiegel, 1983).</p> <p>Both pH and temperature dependence seen in hydrolysis of all 3 chemicals. Rates for sulfone at 25 °C 60 da @ pH7, 6 da @ pH8 (Lemley & Zhong, 1984)</p>		
Aqueous photolysis (MRID 45592105**)	4 da		123 da (12 hr lite/dark)

Aerobic Soil Metabolism Rates, Mineral soils

Study	Soil/ conditions	Aldic arb t1/2	Sulfo xide t1/2	Sulf one t1/2	Ttl carba mate residu e t1/2	Average / 90% upper bound on mean aer soil metabolism t1/2					
						N o so ils	Aldic arb t1/2	Sulfo xide t1/2	Sulf one t1/2	Ttl carba mate residu e t1/2	
00101934	Lufkin fsl, pH6, 50% of field capacity	26			110	00101934	12	13.5 / 16		34 / 48	
	Lufkin fsl, pH7, 50% of field capacity	22			75	00093642 and others	3	13 / 17		70/133	
	Lufkin fsl, pH8, 50% of field capacity	24			83	All studies available for 2001 RED	17	12 / 14	5 (x 3 for single study)	3 (x 3 for single study)	42 / 55
	Lufkin fsl, pH6, 100% of field capacity	9			12	Including post-2001 RED	19	12 / 14	5 (x 3 for single study)	36 / 88 (3 studies)	42 / 55
	Lufkin fsl, pH7, 100% of field capacity	12			14						
	Lufkin fsl, pH8, 100% of field capacity	10			15						
	Houston clay, pH6, 50% of field capacity	11			13						

Aerobic soil metabolism (MRID 44005001)	2.3 da in pH 6.1 sl soil (unnamed from NJ)	Concentrations fluctuated between 9-86% of applied from 7-60 da post treatment	Concentrations fluctuated between 3-80% of applied from 7-60 da post treatment	NOTE: 2000 DER indicates that sulfoxide, sulfone data were too variable to calculate formation, decline rates	Houston clay, pH7, 50% of field capacity	7	12
Aerobic soil metabolism range (MRID 00101934)	7 – 26 da in 2 soils x 3 pH x 2 moisture contents; avg 13.5 da; 90% upper conf bound 16 da	Total carbamate residues (parent, sulfoxide, sulfone)	11 – 110 da in 2 soils x 3 pH x 2 moisture contents; avg 34 da; 90% upper conf bound 48 da	See Ald_AS M_sum, mrid00101934 Worksheets	Houston clay, pH8, 50% of field capacity	8	11
Aerobic soil metabolism, sulfone (MRID 00053370)			3.33 da half-life (pH 6.7 soil)	See Ald_AS M_sum, 00053370 Worksheets	Houston clay, pH6, 100% of field capacity	9	18
Aerobic soil metabolism (MRIDs 00093642, 00080820, 00093640, 00053366)	11, 12, 17 days for 3 soils	Total carbamate residues (parent, sulfoxide, sulfone)	28, 47, 136 for 3 soils	See Ald_AS M_sum, 00093642 Worksheets	Houston clay, pH7, 100% of field capacity	12	16
Lab studies of all 3 forms (Lightfoot et al, 1987; Bank & Tyrrell, 1984)	Combined residues (aldicarb, sulfoxide, sulfone) degraded to oximes, nitrile with half-lives up to 3 months; soil-catalyzed hydrolysis, not aerobic metabolism was driving factor			Qualitative value only	Houston clay, pH8, 100% of field capacity	12	31

	Lightfoot et al, 1987 (MRID 45602904**) has been submitted, reviewed by contractor. It looks at degradation of aldicarb and total carbamates (parent, sulfoxide & sulfone) in surface soil, soil water, distilled water, sat'd zone soil in sterilized/unsterilized conditions (see below)			00053370	Lakeland fsl, pH6.7		3	
Lightfoot et al, 1987 (MRID 45602904**)	1 (unsterilized) – 2.5 (sterilized) da surface 37 (unsterilized) – 15 (sterilized) da subsurf	Combined (parent+degr): 44 (unsterilized) – 10 (sterilized) da surface soil 123 (unsterilized) – 16 (sterilized) da subsurface soil		See 45602904 Worksheet	00093642 and others	Houston clay Norwood sicl	11 12	28 47
Aerobic soil metabolism, sulfoxide		5 da (MRID 45592108)				Lakeland fsl	17	136
Aerobic soil metabolism, 2002 registrant submissions; DERs completed	5.8 da in IL sil soil (pH 5.7); 9.6 da in NC ls (pH 6.4). Recalc t1/2 using all data (MRID 45739801)		15.2 da in IL sil (pH 7.9); 91.2 da in NC ls (pH 6.2). Recalc t1/2 using all data (MRID 45739802)	See 45739801, 45739802 worksheets	45602904	"Plow layer", unsterilized	1	44
Aerobic soil metabolism literature		sulfone & sulfoxide half-lives in Dutch subsoils from 2-131 da under anaerobic cond., 84-1100 da under aerobic cond. (Smelt et al, 1983)		Subsoil rates; qualitative value only.	44005001	NJ soil, sl, pH6.1	2	could not determine
Aerobic aquatic metabolism (literature)	70-173 da in aerobic Dutch surface waters (Vink et al, 1997)			Qualitative value only	45592108		5	

Aerobic aquatic metabolism, 2002-3 registrant submissions **	3.8 da (ttl system) in pH 7.2 water / pH 6.3 sediment (MRID 45592107**)	5 da (ttl system) in pH 7.0 water / pH 6.3 sediment (MRID 45592108*)	3.5 da (ttl system) in pH 7.0 water / pH 6.3 sediment (MRID 45592109*)	See aqmet445 92107 (aldicarb), aqmet445 92108 (sulfone), aqmet445 92109 (sulfoxide)	457398 01	IL sil, pH 7.9	6	15
Anaerobic aquatic metabolism	3 hr with no discernable pattern of formation/de cline of sulfone, sulfoxide (MRID 43805701)	3.4 da (MRID 45592110)	3.5 da (MRID 45592111)			NC ls, pH 6.4	10	91
Published field studies (Jones & Estes, 1995)	Summarized results of 32 field studies for aldicarb in 24 locations. Half life of total carbamate residues (aldicarb, sulfoxide, sulfone) in surface soil ranged from 0.3 to 3.5 months; mean 1.3 mo (40 da) & 90% upper confidence bound on mean 1.5 mo (45 da). In 2 studies, estimated subsurface half life of 5 mo.							